United States Court of Appeals

for the Second Circuit

BRIEF FOR APPELLANT

76-7490, 76-7514

United States Court of Appeals

FOR THE SECOND CIRCUIT

EUTECTIC CORPORATION, NEW METALS CORPORATION and METALLIZING COMPANY OF AMERICA, INC.,
Plaintiffs-Appellees, and Cross-Appellants,

v.

METCO, INC.,
Defendant-Appellant, and Cross-Appellee.

B P/S

APPEAL FROM THE UNITED STATES DISTRICT COURT FOR THE SOUTHERN DISTRICT OF NEW YORK.

DEFENDANT-APPELLANT AND CROSS-APPELLEE'S MAIN BRIEF

ARNOLD SPRUNG,
NATHANIEL D. KRAMER,
BURGESS, DINKLAGE & SPRUNG,
600 Third Avenue,
New York, New York 10016,
Attorneys for Defendant-Appellant and Cross-Appellee.

BATAVIA TIMES, APPELLATE COURT PRINTERS
A. GERALD KLEPS, REPRESENTATIVE
29 CENTER ST., BATAVIA, N. Y. 14020
716-343-0457

INDEX.

Part I—Patent Infringement.

TABLE OF CASES.

VI.

ABBREVIATIONS USED IN THIS BRIEF.

"PX ..." refers to exhibits offered by plaintiff.

"DX ..." refers to exhibits offered by defendant.

"J.A. ..." refers to the joint appendix and pagination.

"O. J.A. ..." refers to the opinion of the District Court and the findings and conclusions incorporated therein.

"E ..." refers to the joint volume of exhibits and pagination.

"R ..." refers to the trial transcript.

" '515 patent" refers to Metco's U.S. patent 3,322,515 in suit. It appears in the joint appendix at E. 805.

" '248 patent" refers to Metco's U.S. patent 3,436,248 in suit. It appears in the joint appendix at E. 816.

IN THE

United States Court of Appeals

For the Second Circuit

Docket Nos. 76-7490, 76-7514

EUTECTIC CORPORATION, NEW METALS CORPORATION and METALLIZING COMPANY OF AMERICA, INC.,
Plaintiffs-Appellees and Cross-Appellants,

v.

METCO, INC.,
Defendant-Appellant and Cross-Appellee.

Appeal From the United States District Court
for the Southern District of New York

DEFENDANT-APPELLANT AND CROSS-APPELLEE'S MAIN BRIEF

PART I—PATENT INFRINGEMENT

I. Statement of Issues Presented For Review

1. Where the language of a claim of a patent is clear and unambiguous, and the district court held it was valid and literally infringed, did it err in failing to enter judgment for the patentee on that claim?

2. Where the accused infringing powders were produced exactly as taught in the patents, functioned in the same manner as those set forth in an example of the patents and achieved the same results as such powders, did the court err in failing to enter judgment for the patentee?

3. Where the court identified key elements of the claims in suit and measured the prior art against these key elements, satisfying itself that they constituted patentable subject matter, did the court err in introducing and considering further elements and criteria, not found in the claims, in its determination of infringement?

4. Did the court err in considering the theory of how the invention worked (the reaction mechanism) in its determination of infringement?

5. Did the court err in interpreting the patent specifications with respect to the term "composite"?

6. Where the claims of the patents in suit place no limitation on the minimum amount of aluminum required in accordance with the invention and the specification teaches amounts as low as about 3% can be used, did the court err in inserting a limitation into the claims calling for a minimum of 10%?

7. Was the court's finding that defendant had failed to show that the reaction mechanism of the accused infringing powders was an intermetallic reaction clearly erroneous?[1]

---

[1] All issues other than issue number 7 raise matters of patent interpretation, that is, questions of law not coming within the strictures of the clearly erroneous rule. *Ziegler v. Phillips Petroleum Co.*, 483 F.2d 858, 867 (5th Cir. 1973).

II. Statement of Facts

A. The Industrial Background

The patents in suit relate to the art of flame spraying, which involves the heating of a material, such as a metal or ceramic (metal oxide) to a temperature at which it is molten or semi-molten and then projecting or propelling it in finely-divided form against the surface to be coated, where the material is quickly quenched or cooled to its solidification temperature and deposited as a coating.[2]

The material being sprayed, known in the art as a "flame spray material," may be in the form of a wire or a finely divided powder. While in certain specialized cases, the flame sprayed coating and the surface on which it is deposited may be heated to a fusing or welding temperature during or subsequent to the spraying, the patents in suit are not concerned with these specialized cases, but are concerned with normal flame spraying, where, in spite of the fact that relatively high melting point materials may be sprayed on the surface of the work piece in molten form, the surface itself remains relatively cool and never approaches its melting point. For this reason, this process has sometimes been referred to as a "cold process." (J.A. 507-08).

If conventional flame spray materials are sprayed on an ordinary cool surface which has not been specially prepared, the coating formed will not stick or adhere strongly enough to produce a coating useful for most purposes. The material, as it is being deposited, will flake-off or after reaching a thickness of several thousandths of an inch (mils), the coating will start to lift off (J.A. 641-42).

---

[2] See generally the Court's Findings of Fact, incorporated into its Opinion at O. J.A. 20-23.

For almost fifty years after the development of flame spraying at the turn of the century, the only manner of assuring a bonding or adherence of the flame spray coating to a surface with any practically useful degree of tenacity (bond strength) was to mechanically roughen the surface by grit-blasting, cutting threads or the like, so as to provide crevices or undercuts into which the sprayed, molten particles could enter and freeze, forming a mechanical interlock (J.A. 670-75; E. 1158-61).

This bonding, being purely mechanical, was completely dependent on the effective degree of surface roughening and undercutting. Once the initial flame spray coating was affixed to the surface, subsequent layers would adhere to it because of the natural roughness and porosity of the initial flame spray coating.

The first commercial utilization of flame spraying was in connection with relatively low melting metals to produce corrosion-resistant and decorative coatings, and it was not until the early part of the 1930's that the art had improved to the point where higher melting metals, such as steels, could be used to build up mechanically wearing surfaces, such as bearing parts, shafts, and other mechanical parts.

The use of flame spray coatings was, however, still limited by the bond strength between the sprayed material and the surface sprayed and the main effort in the art was directed to improving this bond. The developments in this field included special mechanical treatment of grooves cut into the surface so as to roughen them and spread out their tops, forming keyways into which the sprayed metal could mechanically bond, and roughening the surface with a welding-type machine which would sputter rough weld material onto the surface. The latter method was marketed in the early 1940's (J.A. 673-74).

While mechanical treatment was difficult, expensive and not completely reliable, it was not until the middle of the 1940's that any other bonding method was found. At that time, one of the defendant's engineers, Arthur P. Shepard, discovered that when molybdenum wire was sprayed, it would *self-bond* to a clean surface, forming a tenacious bond of about 2,000 psi (O. J.A. 21).

Of all the materials that had been sprayed and experimented with for fifty years since the development of flame spraying, molybdenum was the first and only material found to have this characteristic of self-bonding when flame sprayed, so as to provide a practical and reliable bond coat.[3]

The use of molybdenum wire as a self-bonding material for a bond coat in flame spraying, however, was not without difficulties and drawbacks, as this wire was hard and stiff, difficult to handle and imposed great wear on the flame spray equipment. Furthermore, its use was messy and dirty in view of the drawing compound which had to be used in the fabrication of the wire. It required relatively low spray rates and high artisan skill to obtain reliable bonding. In addition, the molybdenum would not effectively self-bond on copper or copper alloy surfaces, such as bronzes or brasses, or nitrited

---

[3] "Self-bonding," a term which predates the patents in suit (J.A. 732), is a term of art in the flame spray field, which has an established and conventional meaning. It is a shorthand designation for a flame spray material which is capable of tenaciously bonding to a smooth, clean surface on which it is sprayed, with a bond strength of a minimum of about 2000 p.s.i., and which may be used as a surface upon which other materials may be flame sprayed. Self-bonding materials are, therefore, sometimes referred to as bonding materials (J.A. 362-63, 463-64, 487, 729, 908-09, 928; See also O. J.A. 21, 61-62).

In addition to smooth, clean surfaces, self-bonding materials are conventionally used on roughened or threaded surfaces for purposes of enhancing reliability. Thus, self-bonding materials will aid in bonding to both conventionally roughened surfaces and clean smooth surfaces (J A. 744-55).

hard surfaces and it would deteriorate if subjected to temperatures above 600°C., so that it could not be used for a bond coat in fabricating or repairing parts which might be subject to these higher temperatures during use. Finally for some reason, if molybdenum was sprayed in powder form, it was not self-bonding, and *no* self-bonding powdered flame spray material was known or available (O. J.A. 21-22; J.A. 646-48, 656-58, 676, 226-28).

In view of this, if it were desirable to spray higher melting materials, such as ceramics which were available in powder form, but which could not be satisfactorily fabricated into a wire, it was not uncommon to first spray a bond coat of molybdenum with a wire spray gun and then spray the final coats with the powder gun. This was expensive and cumbersome, involving the use of two different types of equipment.

In spite of all these drawbacks and disadvantages, the molybdenum wire remained the only known and widely used self-bonding material in the flame spray field from the time of its introduction and commercialization around 1948 for over a decade and a half until the introduction of the self-bonding flame spray materials as described in the patents in suit (O. J.A. 21-22; J.A. 646, 675; E. 1166, 1156).

B. The Patents In Suit[4]

The patents in suit disclose and are directed to the only practical and commercially useful self-bonding flame spray materials other than molybdenum wire which have appeared during the seventy-year history of the flame spray art. They

[4] The patents in suit, 3,322,515 (hereinafter the '515 patent) and 3,436,248 (hereinafter the '248 patent) appear in the appendix at E. 805 and E. 816 respectively.

are based on the discovery that if the artisan selects two metal components having certain specific metallurgical characteristics (capable of exothermically reacting together to form an intermetallic compound) and combines them in the form of a flame spray composite, e.g., a powder of composite particles, the same, when flame sprayed, is self-bonding with a higher bond strength than molybdenum and overcomes substantially all the previous disadvantages and drawbacks encountered with molybdenum (O. J.A. 62, 68-69; J.A. 656-58, 660).

For the purpose of this litigation, only the first-discovered and most preferred of these materials need be considered—a flame spray material in the form of a composite of aluminum and nickel.

As defined in the patents in suit, the term "composite" is a structurally integral unit containing the components, *e.g.*, the nickel and aluminum, physically connected together, but not metallurgically combined as an alloy, and does not include a mere mixture of the components which may be physically separated without any destruction of this structure (Col. 2, lines 57-69, of the '515 patent; col. 2, line 70, through col. 3, line 9, of the '248 patent). Thus, in the case of powder, the term "composite" requires that each powder granule contains separate and distinct areas or segments of aluminum and nickel, physically connected, but unalloyed together.

The composite requiring primary consideration in this litigation is a preferred composite powder having a nucleus or core of nickel and a coating layer of finely divided aluminum powder particles bound to the nucleus with a binder. The production of such a powder is described in the '515 patent (col. 5, lines 1-29), and one example of a powder following

this procedure is set forth in Example 31, beginning in column 13.[5] Such a powder is, of course, self-bonding.[6]

Claim 4 generically claims this powder and claim 14 specifically claims the same. Claim 14 reads as follows:

> "A flame spray powder in the form of individual clad particles comprising a nucleus of nickel and a coating layer of finely divided aluminum particles bound to the nucleus with a binder and characterized by the ability of generating heat during flame spraying which aids in bonding to the surface being sprayed."

The production of such powder is described in the '248 patent beginning in column 5, line 5 through line 33, and an example of the production of a powder by this process is again set forth in Example 31. Claim 4 of the '248 patent is directed to an improvement in the flame spray process by utilizing this composite or coated powder as the flame spray material.

Defendant started marketing nickel-aluminum composite flame spray materials as disclosed in the patents in suit in about 1964, marketing both a nickel-aluminum composite powder and wire. Defendant's nickel-aluminum self-bonding flame spray materials quickly replaced molybdenum as the self-bonding materials of choice and opened up entire new areas in flame spraying which had not previously been possible because of a lack of satisfactory bond material. For example in the aerospace industry flame spraying of certain jet engine parts became practical and acceptable with the advent of the nickel-aluminum composite self-bonding

---

[5] See generally the Court's findings, O. J.A. 24 + nn. 4 & 5.

[6] Example 1 of the patent notes the coating is self-bonding (col. 7, lines 23-28). Example 31 points out that the coating found has the same characteristics of that in Example 1 (self-bonding) with *twice the strength.*

materials as disclosed in the patents in suit. The commercial success of these materials is attested to by the more than $20 million dollars of sales of Metco flame spray nickel-aluminum composite (O. J.A. 62, 68-69; J.A. 648-52, 653-54, 655-69, 661-62, 676-77).

The first composite powder marketed by Metco consisted of an aluminum core plated with a nickel coating and was designated as the "404 powder." Defendant then improved the ease of production of the powder by following the "binder" method as set forth beginning in column 5 of the '515 patent, and produced a powder following this procedure which was designated as the "450 powder." The latter has certain advantages over the initial 404 material, such as lower smoke and dust generation during spraying (J.A. 649, 680).

C. Outright Duplication By Plaintiff

Plaintiff, Eutectic, as early as 1966 learned of and showed an interest in Metco's nickel-aluminum composite self-bonding powder, then on the market (E. 1). By June of 1967, it had obtained and tested Metco's 450 nickel-aluminum composite powder (E. 43 at 50712; J.A. 106 at Para. 7; E. 1099-1102, 1108; J.A. 1037). Plaintiff, Eutectic, also knew of defendant's '515 patent and requested from its attorneys a validity opinion concerning this patent in April of 1968. As late as January of 1970, Eutectic was apparently unsuccessful in developing its own self-bonding powders which would avoid the patent by utilizing components not specified in the patent, as for example, aluminum-clad nickel *oxide* powders (E. 1085-91; E. 13, 14, 16, 19).

After these unsuccessful attempts, in March 1970, plaintiff proceeded to very quickly exactly copy Example 31 of the

'515 patent and produced its first successful nickel-aluminum composite self-bonding powder.[7]

While this powder, produced by exactly copying Example 31 of the '515 patent, was completely satisfactory (E. 1203-04), it was brought to the plaintiffs' attention that certain jet engine producers had written specifications for self-bonding powders based on the Metco 450 powder, which, while produced exactly as described in Example 31 of the patent, contained somewhat less aluminum, *i.e.*, 5% by weight (E. 20, 4-1; E. 1205-07; DX MG at 84-86; E. 1110-11) an amount taught in the disclosure of the patents, see *infra* at 37-39.

Eutectic, then quickly slightly changed its formulation to an outright duplication of Metco's 450 material, offering the same on the market as "equivalent in every respect to the Metco 450 product" and designating the same initially as "BN 9048" and later as "Exotec" powder (E. 26; Plaintiff's Interrogatory Answer 86 dated 8/13/73; Answer 84 dated 10/26/73).

Eutectic subsequently marketed an additional nickel-aluminum composite self-bonding powder under the designation "Xuperbond," the same simply being "Exotec" with a very minor amount of a color additive (J.A. 239-40; 784-85; E. 1094). Plaintiff Eutectic also markets a material called "Durotec," which consists of 10% of the "Exotec" and 90% of a nickel-base self-fluxing alloy (E. 1084; J.A. 785). Plaintiff Metallizing markets a material known as "Moguloy M-55," which is obtained from Eutectic and which is identical to "Exotec." (J.A. 236, 783-84; E. 1169).

---

[7] E. 16-1 is the Yurasko work sheet. Compare the proportions of aluminum to nickel in samples 160-1 and 160-2 with the identical proportions in Example 31 of the patent. E. 812; E. 1196-97. The process used to make the samples is set forth in E. 18, 1209-10.

III. The Trial Court's Finding of Non-Infringement

In spite of the fact that the plaintiffs' accused powders are produced in exact accord with the procedure as specified in column 5, lines 1-29, of the '515 patent and column 5, lines 5-33, of the '248 patent, and exemplified in Example 31 of these patents, perform the same function, and produce the same result, and in spite of the fact that the trial court found literal infringement of claim 14 of the '515 patent, the Court ruled against defendant on the issue of infringement, holding defendant had not met a burden of proving that the accused infringing powders, when sprayed, generated heat by means of forming an intermetallic compound.

IV. ARGUMENTS

Summary

1. Where, as here, the language of claim 14 of the '515 patent is clear and unequivocal and the district court held it was valid and literally infringed, it erred in failing to enter judgment for the patentee.

2. Since the accused infringing powders were produced in exact accordance with the teaching of the patent, functioned in the same manner as those set forth in an example of the patent and achieved the same result as such powders, the court should have found infringement by equivalents even if no literal infringement were present.

3. As the court itself identified the key elements of the claims in suit and measured the prior art against these key elements, satisfying itself that they constituted patentable subject matter, it should have used these same key elements in its determination of infringement, rather than introducing and considering further elements and criteria not found in the claims.

4. The trial court was in error in considering the theory of how the invention worked (the reaction mechanism) as an essential element of infringement.

5. The court erred as a matter of law in interpreting the patent specifications with respect to the term "composite."

6. As the claims of the patents in suit place no limitation on the minimum amount of aluminum required in accordance with the invention and the specification teaches amounts as low as about 3% can be used, the court erred in inserting a limitation into the claims calling for a minimum of 10%.

7. The court's finding that defendant had failed to show that the reaction mechanism of the accused infringing powder was an intermetallic reaction was clearly erroneous.

1. The Clear Language of Claim 14 of The '515 Patent is Infringed by The Accused Powders.

The '515 patent teaches the artisan, as a preferred embodiment of the invention, to make a flame spray powder by blending finely divided aluminum powder with a resin binder, mixing in somewhat coarser nickel powder and continuing mixing until the binder is dry, resulting in a free-flowing powder having a nickel core clad or coated with a dry film of binder containing the aluminum particles ('515 patent, col. 5, lines 1-28; Example 31, col. 13). The patent teaches that the flame spray powder produced in this manner is self-bonding, adhering to a base without conventional surface preparation or roughening. Because of the natural characteristics of the sprayed material, it will allow further material to be sprayed thereon with good bonding (Example 1, col. 7, lines 23-27, incorporated by reference into Example 31, col. 14, lines 1-4).

Claim 14 clearly and precisely claims this powder

> "A flame spray powder in the form of individual clad particles comprising a nucleus of nickel and a coating layer of finely divided aluminum particles bound to the nucleus with a binder and characterized by the ability of generating heat during flame spraying, which aids in the bonding to the surface being sprayed."

Plaintiffs' accused Exotec powder is precisely the powder defined by the language of claim 14 and has been produced in precisely the same manner as set forth in the patent specification, having the same function, *i.e.*, being a flame spray powder, and producing the same result, *i.e.*, forming a self-bonding coating which can serve as a bond coat in flame spraying. The patent points out that when such powder is sprayed, an exothermic reaction may be noted, and such reaction is noted in the spraying of the accused powder. Indeed, the accused powder has been promoted as an exothermic powder.[8]

The District Court found that "claim 14 read literally would cover the 95% nickel-5% aluminum accused powders." (O. J.A. 79).

Having found patent validity and literal infringement, the court should have heeded the rule of the Supreme Court in the leading infringement case, *Graver Tank Co. v. Linde Air Products Co.*, 339 U.S. 605, 607 (1950):

> "In determining whether an accused device or composition infringes a valid patent, resort must be had in the first instance to the words of the claim. If accused matter falls clearly within the claim, infringement is made out and that is the end of it."

---

[8] E. 1073-75, 1078-80; plaintiffs' Interrogatory Answer 84, JA 108 (flame spray powders); Answer 85 (a), JA 108 (nickel and aluminum); Answer 84, E. 48, E. 49; E. 998, 1066 (exothermic); E. 48, 49, E. 97, J.A. 746-55 (aids in bonding to all surfaces, including smooth clean surfaces—"self-bonding.")

Accord Laser Alignment, Inc. v. Woodruff & Sons, Inc., 491 F.2d 866, 872 (7th Cir. 1974); *Williams Bit & Tool Co. v. Christensen Diamond Products Co.*, 399 F. 2d 628, 634 (5th Cir. 1968); *Kolene Corp. v. Motor City Metal Treating, Inc.*, 440 F.2d 77, 82 (6th Cir. 1971); *White v. Fafnir Bearing Co.*, 263 F. Supp. 788 (D. Conn. 1966), *aff'd.*, 389 F.2d 750 (2d Cir. 1968); see also *Maclaren v. B-I-W Group, Inc.*, 535 F.2d, 1367, 1373 (2d Cir. 1976):

> "where the claim language is clear, it controls and may not be limited or distorted by resort to specifications, title or drawings."

As discussed in greater detail *infra,* however, the district court failed to follow this well established rule and erroneously proceeded to insert additional limitations into the claims, based principally upon the novel doctrine that the reaction mechanism, the theory of how the invention worked, was a material issue in the case, and furthermore erroneously placed a burden on the patentee to show by a preponderance of evidence that the reaction mechanism for the accused powders was the same as that posited in the patent.

2. Plaintiff Has Conceded Its Accused Powders Are Equivalent to Those Taught In The Patents In Suit.

Even if there were no literal infringement, as found by the court, the court should have found infringement of the patents in suit by equivalents in view of the concessions by plaintiff as to the accused infringing powders.

Infringement by equivalents is shown where the accused device or composition

> "works in substantially the same way to accomplish the same results."

Laser Alignment, Inc. v. Woodruff & Sons, Inc., supra at 872.

Dr. Grant, plaintiff's expert, testified that the accused powders were produced in accordance with the teaching of the patent:

> "Q. All right, now would you—you have described the production of the accused Exotec material. Would you tell the Court the differences in the procedure of making the Exotec from that general procedure described in the '515 patent?
>
> A. I am not familiar that there is—with the fact that there is any difference.
>
> Q. Well, according to your understanding, Exotec powder is made as described in this portion you just read—
>
> A. I think so.
>
> Q. —in the patent?"

(J.A. 252).

Moreover, the powders work in the same manner as those described in the patent, *i.e.* they are exothermically reacting (plaintiffs' brochures E. 48, 49, answer to Interrogatory 84, J.A. 108) and achieve the same result as those described in the patent, *i.e.* they are self-bonding (E. 48, 49; J.A. 401).

Even if the standard analysis set forth above were improperly augmented by a consideration of reaction mechanism,[9] the result is the same. Plaintiffs' expert, Dr. Nicholas Grant has unequivocally conceded that because of its form and structure, *the accused powder generates heat by the same reaction mechanism as that of the powder specifically exemplified as Example 31 of the '515 patent,* the embodiment of the invention covered by claim 14 (J.A. 392, 396-400).

The court below unfortunately failed to consider Dr. Grant's concession. All comparisions of the court suggesting a difference in reaction mechanism were comparisions with

---

[9] See the discussion of theory of reaction *infra* at 18.

another, early embodiment of the invention, the Metco 404 powder, shown, *e.g.*, in Example 1 of the patent.

There is no essential difference in structure, mode of operation or result between the powder disclosed in Example 31 of the patents and the accused powders.

Plaintiff's mere colorable changes and adaptation of the patent teaching (lowering the aluminum content in Example 31 to conform with the competitive Metco 450 powder and the jet engine specification drawn about it) could not take the accused composition outside the scope of the patent. *Rich Products Corp. v. Mitchell Foods, Inc.*, 357 F.2d 176 (2d Cir. 1966); *Ling-Temco-Vought, Inc. v. Kollsman Instrument Corp.*, 372 F.2d 263 (2d Cir. 1967).

3. The Court Below Was Inconsistent In Determining The Scope Of The Claims In Its Discussion of Validity And Infringement.

The Supreme Court has cautioned against treating a patent claim as

> "a nose of wax, which may be turned and twisted in any direction, by merely referring to the specification . . ."

White v. Dunbar, 119 U.S. 47, 51 (1886).

In its lengthy and thorough discussion of the validity of the claims in issue, the court below found the scope of the claims as follows for purposes of comparison with the prior art:

> "the four key elements are (1) nickel-aluminum 'composite' powder, (2) flame spray process, (3) exothermic reaction generating additional heat, and (4) which aids in self-bonding the resultant coating to the substrate." (O. J.A. 59).

In an earlier finding, the court determined the meaning of the term "composite:"

> "The term 'composite' in the patent designates not a mere mixture of powdered component metals but 'a structurally integral unit' in which each granule of powder contains particles of nickel and aluminum bound in close contact with each other by a dry film binder. The patent also describes a simplified method of 'cladding' the component metals so as to form the required composite." (O. J.A. 24).

The court then concluded there was no prior art which anticipated the claims as so interpreted or rendered them obvious under 35 U.S.C. 103.

The District Court's own findings show that the four key elements of the claims at issue are met by plaintiffs' accused powders:

> (1) "There is no question that both Metco 450 and Exotec are composed of *core particles of nickel coated with finely divided aluminum* powder in a phenolic binder . . ." (O. J.A. 77)[10]
>
> (2) "Eutectic developed its own 'Roto-tec' *flame spray process* based upon Exotec." (O. J.A. 18).
>
> (3) "In 1970 Eutectic announced the development of a new *exothermic* nickel-aluminum powder tradenamed 'Exotec.' " (O. J.A. 17-18).
>
> (4) "Moguloy [identical to Exotec] is described as a 'Nickel-Aluminum *Self-bonding* powder.' DX KH, DX KK" (O. J.A. 77).[11]

These findings, thoroughly supported by the record,[12] make out a clear case of infringement.

---

[10] Emphasis added, except where noted.

[11] Plaintiffs freely admitted that their accused powders were self-bonding and marketed them as bonding coats, and no issue to the contrary was ever raised.

[12] *Supra* at 13, Footnote 8.

As the court had already satisfied itself that the claims as so construed were valid, there was no reason for it to inexplicably *narrow* the claims, during its discussion of infringement by "referring to the specification" and reading in new limitations.

4. The Court Erred In Considering The Reaction Mechanism Theorized By The Patentee Material and Comparing It With The Reaction Mechanism of The Accused Infringing Powders.

The entire purpose of a patent specification is to teach the artisan how to achieve a new and useful result.

The patents in suit teach the skilled artisan with clarity and certainty how to fabricate a new flame spray powder which, when used, will produce a self-bonding coating.

The specification of the patents in suit teaches that these new self-bonding materials can be fabricated, *inter alia*, by preparing flame spray powders having a core of nickel and finely divided aluminum bound to its surface with a binder.

A skilled artisan can reproduce the teaching of the patents and reap their full benefits by achieving the self-bonding results with no difficulty. He could not care less about the reaction mechanism or explanation of why those results were obtained.

For this reason, the Supreme Court long ago ruled that the reaction mechanism or theory of the invention was irrelevant in a patent case.

> "An inventor may be ignorant of the scientific principle, or he may think he knows it and yet be uncertain, or he may be confident as to what it is and others may think differently. All this is immaterial, if by the specification

> the thing to be done is set forth that it can be reproduced." *Eames v. Andrews*, 122 U.S. 40, 56 (1887).

Accord, Diamond Rubber Co. v. Consolidated Rubber Tire Co., 220 U.S. 428, 435-36 (1911); *Danbury & Bethel Fur Co. v. American Hatters & Furriers Co.*, 54 F.2d 344, 345 (2d Cir. 1931); *Katz v. Horni Signal Mfg. Corp.*, 145 F.2d 961, 963 & n.5 (2d Cir. 1944) (claim language suggesting theory of invention is immaterial).

Naturally, if the inventor is incorrect in the theory posited, his case cannot suffer.

> "It is certainly not necessary that he understand or be able to state the scientific principles underlying his invention, and *it is immaterial whether he can stand a successful examination of the speculative ideas involved* * * * * *"
>
> *Lever Brothers Co. v. Proctor & Gamble Mfg. Co.*, 139 F.2d 633, 638 (4th Cir. 1943).

One of the most recent applications of this rule was in *Devex Corporation v. General Motors Corporation*, 467 F.2d 257 (3d Cir. 1972). There the defendant sought to avoid infringement by arguing that the "chemical interactions" that occurred during its accused lubrication process were different from those reported by the patentee. In reversing the lower court's holding of non-infringement, the court ruled:

> "If it is directly determinable that the two lubricants have essentially the same components, are applied in the same way and that the results of their use are essentially the same, the disputations of chemists about the chemical interactions that occurred in the processes cannot be decisive." *Id.* at 261.

In the instant case, the inventors' first successful self-bonding flame spray composite powder was made from nickel and aluminum. Since nickel and aluminum are two metals which

have the known metallurgical ability of reacting together exothermically to form intermetallic compounds, the inventors theorized that the mechanism of reaction when the nickel-aluminum composites were flame sprayed was the interaction of the two to form an intermetallic compound. Accordingly, they disclosed in their patent other combinations of metals (not here at issue) which could form intermetallic compounds and made numerous reference to the generic group of "exothermically reacting intermetallic compound forming composites."

The broadest claims of the patents (not here in issue) cover these various combinations by referring to components for the powders as metals "which will exothermically react with each other when melted, forming an intermetallic compound." The definition and characterization apprises the artisan which metal pairs *to select* from the universe of metals available, and if he does this and they work, that is all that is required, irrespective of whether, during the spraying, an intermetallic compound is actually formed. In making his initial choice, the artisan has exhausted the necessary teaching and reaped the benefits of the broadest aspects of the invention.

The definition and characterization are, of course, completely unnecessary and irrelevant with respect to the inventors' original metallic pair—Nickel and Aluminum, which is separately and specifically taught in numerous places throughout the patent and separately and specifically claimed in the three claims at issue herein, claims 4 and 14 of the '515 patent and claim 4 of the '248 patent.

At trial, plaintiffs abstained from making the normal defenses with respect to infringement and expended hundreds of pages of testimony on the issue of reaction mechanism. They

urged, in brief, that their powders (and the patentee's Metco 450 powder from which it was exactly copied[13]) worked (self-bonded) because of an oxidation reaction, while the embodiment shown in Example 1 of the patent and in numerous other embodiments therein worked because of an intermetallic reaction.

The Court, in its decision, however, ignored the cases cited in sections 1-4 herein and the testimony of plaintiffs' expert that the reaction mechanism of Example 31 of the patent was an oxidation reaction, the same as that for Exotec and erroneously ruled that

> 1) The reaction mechanism of intermetallic compound formation was to be read into the nickel-aluminum claims in issue. The mechanism for doing so was the reinterpretation of the term "composite" to now include a requirement of this reaction mechanism and an insistence that the term and reaction mechanism be read into each claim, even where the precise form of composite was already spelled out in the claim (*i.e.* claim 14 of the '515 patent).
>
> 2) As a direct outgrowth of the intermetallic compound formation requirement, the court imposed a further mandatory requirement of 10% aluminum in the composite powder in each claim (notwithstanding the absence of any express limitation) as that is the minimum amount which the court believed was required at equilibrium conditions to produce intermetallic compounds of nickel and aluminum.
>
> 3) Finally, notwithstanding the fact that the patentee had proven literal infringement and infringement by equivalents, the court imposed a further burden of proof

[13]And additionally the powder of Example 31 of the patents.

on the patentee to show that the intermetallic formation reaction mechanism was, in fact, used by the accused powders.

The court should have followed the long line of cases from *Eames* to *Devex,* disregarded all contentions relating to the spurious issue of reaction mechanism, concluded that the claims in issue were literally infringed (section 1, *supra* and section 5, *infra*) and infringed by equivalents (sections 2 and 3, *supra*) and entered judgment for defendant.

5. The Court's Reinterpretation of The Term "Composite" Was Erroneous.

Claim 14 of the '515 patent does not include the generic limitation "composite," since only a particular physical form of the nickel-aluminum composite powder disclosed in the application (*e.g.* in column 5, lines 1-28 and in Example 31) is covered by the claim.[14]

Claim 4 of the '515 patent and claim 4 of the '248 patent are broader, covering this physical form and other physical forms of nickel-aluminum flame spray powders, provided they are "composites."

The term "composite" as used and defined in the specification is simply intended to designate the *physical form* of the flame spray material. In the case of a powder, it does not include a mere mixture of the components, but only "structurally integral units" such as described in Examples 1 and 31.

The court below clearly recognized that the term "composite" applied only to the physical form of the powder in its

[14] "individual clad particles comprising a nucleus of nickel and a coating layer of finely divided aluminum particles bound to the nucleus with a binder."

discussion of validity (O. J.A. 24). Indeed, the patentee's own parent applications also make clear that the term composite relates to physical form, as they frequently refer to composites having constituents which *could not* possibly react to form intermetallic compounds.[15]

Finally, plaintiffs themselves have used the designation "composite" to refer to their own accused powders (DX KH, E. 46, 86) despite their argument at trial that these powders do not undergo an intermetallic reaction.[16]

Thus, the court's reinterpretation of the term "composite" to include a requirement of intermetallic formation, during its discussion of patent infringement, is not only legally incorrect as it makes material the theory of the invention, and inconsistent with its earlier interpretation of the term, but also inconsistent with the conventional use of the term by the patentee and the accused infringers.

Had the court given the term composite its proper scope in its discussion of infringement it should have found both claim 4 of the '515 and claim 4 of the '248 patents literally infringed.

---

[15] See, *e.g.* E.176, the grandfather application leading to the patents in suit and including other and different inventions for foreign priority purposes. This application refers to clearly non-intermetallic forming powders of nickel-boron coated with nickel (Example 6), Al_2O_3 coated with nickel (Example 8) and industrial diamond coated with nickel (Example 9) as "composite powders."

[16] They have also used the term composite to refer to form rather than reaction mechanism in their main brief herein where they refer to a number of "composite" flame spray powders in the prior art which could not possibly undergo intermetallic reactions (Typed brief at 15); see also the discussion in their typed brief at 17: "The '515 patent in suit discloses two types of composites".

6. The Court Erred By Reading a Limitation Into The Claims Requiring 10% Aluminum Content In The Powders.

The sole difference between the accused powder and the specific powder exemplified in Example 31 of the patents resides in the amount of aluminum used. The accused powder contains about 5% aluminum (as does the Metco 450 powder).

The trial court erroneously concluded that the patents taught at least 10% aluminum was required and this amount was actually necessary for an exothermic intermetallic compound forming reaction.

The trial court based this conclusion primarily on two factors:

(i) the specific patent Examples did not show less than 10% aluminum; and

(ii) the equilibrium phase diagram, (E. 1004), shows that at least 10% aluminum is necessary to form a nickel-aluminum intermetallic compound.

As to point (i) above, it is well established that the claims, and not the Examples, limit the invention. It is settled law that the numbered Examples are merely illustrations of specific modes contemplated by the inventors for carrying out their inventions and can be by no means construed as limitations on the scope of the claims. Indeed, under 35 U.S.C. 112, all that the inventor is required to do is to describe one mode, i.e. the best mode, contemplated by him for carrying out the invention. He is certainly not required to set forth examples of all modes contemplated or covered. *Smith v. Snow*, 294 U.S. 1, 11 (1935); *Reiner v. I. Leon Co.*, 285 F.2d 501, 504 (2d Cir. 1960); *B.B. Chemical Co. v. Ellis*, 117 F.2d

829, 833 (1st Cir. 1941); *Ziegler v. Phillips Petroleum Company*, 483 F.2d 858, 871 (5th Cir. 1973).

In *International Nickel Co. v. Ford Motor Co.*, 166 F. Supp. 551 (S.D.N.Y. 1958) Judge (now Chief Judge) Kaufman interpreted a patent claim covering the addition of magnesium to iron to improve its properties. The lower limit of magnesium in the claims was a "small but effective amount." The specification spoke of a "critical minimum" of 0.04% magnesium and apparently no examples taught less.

Ruling that another general teaching of the patent prescribed an area of flexibility depending on the amount of impurities involved, however, the court concluded that the claims were infringed even if less than 0.04% magnesium was used:

> "[I]f the patentees had intended to limit all their claims to iron containing specified amounts of retained magnesium one might have expected them to so provide. *Id.* at 557.

In the instant case, the patents set forth that the Examples are given by way of illustration and not limitation (see '515 patent, col. 6, lines 46-47). Moreover, the patent specifications clearly teach that while stoichiometric proportions (the exact proportions of components required for a given reaction) are preferred within the scope of the invention, an excess of one or the other component may be used, provided the relative amounts are sufficient to release "about 3000 calories per gram atom" upon combining. Col. 3, lines 50-56 of the '515 patent and col. 3, lines 59-65, of the '248 patent.

Convincing and uncontroverted evidence presented during trial shows that 5% of aluminum will combine with nickel to produce 3700 calories of heat per gram atom and that only

about 3% of aluminum is required to produce the 3000 calories, so that *any teaching as to a minimum amount of aluminum in the patent is a teaching of about 3% aluminum* (DX MM; J.A. 804-05, 766, 773-74, 718-19, 720, 636-37, 272; E. 143, 149, 156, 157; DX IX at 51).

This was confirmed by the file history of the patents in suit. During prosecution of the '248 patent, Mr. Dittrich, one of the inventors, submitted an affidavit showing that powders made in accordance with the method of Example 31 and having as little as 2½% aluminum were self-bonding, having a bond strength of 2250 psi (E. 789-90; see J.A. 773-74; see also O. J.A. 41-42).

This same affidavit further indicated that powder made in accordance with the procedure of Example 31, and having 5% aluminum (the exact powder plaintiff started selling as Exotec several years later) was clearly self-bonding and had almost the identical bond strength as a 10% aluminum powder (3570 psi vs. 3610 psi). *Ibid.*

Similarly, during prosecution of the '515 patent, the Examiner sought to have the applicants set out a range of proportions in their claims, but the applicants refused to limit the claims to any specific numerical porportions, pointing out that the relative proportions of the components were not critical and all that was necessary were amounts of components that could react (PX 5 at 70-71).

Quite obviously, 5% (and even as low as about 3%) aluminum, within the disclosure of the patent would so react and specifically be capable of producing a non-stoichiometric intermetallic compound within the meaning of the patent, *i.e.*, one whose formation involved at least 3,000 calories per gram atom.

As to point (ii) above, all that the phase diagram (E. 1004), shows is that 10 atomic percent aluminum[17] may be required under theoretical equilibrium conditions to form some *stoichiometric* nickel aluminide intermetallic compound Ni_3Al. As noted above, however, the patent clearly and unequivocally teaches and contemplates use of amounts of nickel and aluminum to form *non*-stoichiometric nickel aluminides, and such non-stoichiometric nickel aluminides have been well recognized in the flame spray art.

Plaintiffs' expert, Dr. Grant, is apparently alone in recognizing only two intermetallic compounds of nickel and aluminum, the stoichiometric nickel aluminides, NiAl and Ni_3Al. The evidence of record shows that men skilled in the art refer to all reaction products of nickel and aluminum (including those with only a few percent aluminum) as nickel aluminides. J.A. 763-64, 774-75, 1021 (Ingham) ("alpha nickel" is simply one variety of nickel aluminide intermetallic compound); J.A. 556 (Dittrich); J.A. 519-20 (Quaas); J.A. 665-66 (Montgomery); E. 917 (Patel's Report); E. 21, 42, DX KO (AVCO's pre-reacted nickel aluminide with 5% aluminum).

Of course where 5% aluminum is used in a flame spray powder, in accordance with the patent, one would obviously expect that the predominant form of nickel-aluminum intermetallic compound which could form would be the non-stoichiometric nickel aluminide having about a 5% content of aluminum, what Dr. Grant would prefer to call a "solid solution" of nickel and aluminum. When Dr. Grant finally studied the coatings formed by flame spraying the accused Exotec powder, he found precisely that. *Infra* at 34-35.

---

[17] This is only 5 weight percent aluminum (E. 1004; J.A. 271) the exact amount contained in the accused powders, and the court below apparently failed to note this.

The court's aside that when only 5% aluminum is used it follows that "heat is generated by an oxidation reaction" (O. J.A. 85) is unsupported by the record. At most, Dr. Grant sought to distinguish non-stoichiometric reactions of aluminum with nickel from stoichiometric reaction by labeling the exothermic heat generated by the former a "heat of solution" between the aluminum and nickel.

Dr. Grant had to admit, however, that the combination of 5% aluminum, and even smaller amounts of aluminum, with nickel, involved a chemical reaction, with electron exchange (J.A. 1076-77), which is the same reaction involved in the formation of a stoichiometric intermetallic compound such as Ni_3Al (J.A. 1078).

In fact, when an atom of aluminum combines with nickel, resulting in a chemical reaction with electron exchange, the incremental amount of heat given off for that atom's reaction is the same, regardless of whether there is a total of 1% aluminum present or 20% aluminum present. The individual atom of aluminum has no way of knowing how many other atoms are reacting. Thus, the amount of heat generated simply increases proportionately with the amount of aluminum, with nothing different happening as the amount of aluminum approaches, reaches and exceeds the amount necessary to form a stoichiometric intermetallic compound (E. 149, 156, DX MM, J.A. 806-09; 721-22; 717-718).

The court's remark concerning oxidation tied to the *amount* of aluminum was apparently based on a misunderstanding of plaintiffs' contentions on the theory of invention, which went to the *form of the powder.* Plaintiffs' oxidation theory expounds that with aluminum particles bound to a nickel nucleus with a binder, during the brief instant of heating to melting temperature, the binder decomposes, freeing

aluminum particles which fly free from the binder and are burnt in an exothermic oxidation reaction.

This theory, however, has nothing to do with the amount of aluminum, and deals only with the form (a form explicitly taught in the patents and exemplified in Example 31). Thus, plaintiffs' theory is equally applicable to the powder of Example 31, where their expert has theorized the 15% aluminum would fly free of the binder and burn in the same manner as Exotec, with 5% aluminum, would (J.A. 395-98).

7. The Court Erroneously Placed A Burden On Defendant To Show The Reaction Mechanism For Exotec Was An Intermetallic Reaction And Erroneously Failed To Find That Such Reaction Mechanism Took Place.

As noted above in section 4, the reaction mechanism should be treated as immaterial in a patent case. The court below treated it as material and put the patentee to the burden of showing that an intermetallic reaction took place when the accused powders were sprayed (O. J.A. 89).

A. The District Court Erred In Its Assignment Of The Burden Of Proof.

Having established that the accused powder literally infringed claim 14 of the patent, defendant had, at the very least, established a prima facie case of infringement.

If any further burden had to be met on the infringement issues, as a matter of law, the burden should have been on the plaintiffs to show that the accused powder did not perform in substantially the same way to accomplish the same result as the powders taught in the patent. Calvert, *Encyclopedia of Patent Practice* 456 ("The burden of proof shifts to the defen-

dant as to the question of infringement after plaintiff has made out his prima facie case....") *Accord, Kalo Inoculant Co. v. Funk Bros. Seed Co.*, 161 F.2d 981, 989 (7th Cir. 1947), *rev'd on other grounds*, 333 U.S. 127 (1948); see *Steinfur Patents Corp. v. Meisel-Galland Co.*, 27 F. Supp. 737, 739-40 (E.D.N.Y. 1939).

B. The District Court Erred In Failing to Find Exotec Proceeded By An Intermetallic Reaction Mechanism.

The lower court ruled defendant patentee had failed to meet a burden of proof on the reaction mechanism; its opinion nowhere expressly adopts, however, the plaintiffs' oxidation theory.

Actually, defendant's evidence presented at trial clearly and convincingly shows that the exothermic reaction which occurs during flame spraying of the accused powder involves a reaction between the nickel and aluminum, as opposed to an oxidation of the aluminum.[18] This evidence may be summarized as follows:

1. Plaintiff has, in its patent application covering the accused powder Xuperbond,[19] admitted that the accused powder Exotec self-bonds because of an intermetallic reaction between the nickel and aluminum. In the application, the prior art powders "prepared by agglomerating 5% by weight fine aluminum powder with coarse size nickel powder" (E. 39), *i.e.*, the Exotec and Metco 450 powders, are characterized as containing

> "two metals which when subjected to heat, *inter-reacted* to generate an exothermic reaction" (E. 36)

---

[18] Much of this evidence was totally ignored by the Court below.

[19] E. 35, filed May 11, 1972, see Plaintiffs' Answer to Interrogatory 94—J.A. 109; J.A. 105, paragraph 3.

This interreaction is obviously *not* an oxidation reaction, but rather an intermetallic reaction.[20]

2. If the nickel core of the accused powders is replaced with a core material which cannot react exothermically with the aluminum in an intermetallic reaction, self-bonding onto the sprayed surface does not occur (J.A. 816), despite the theoretical irrelevance of such replacement if the aluminum oxidation hypothesis were correct.

Cores of aluminum, nickel oxide and aluminum oxide were clad with aluminum and flame sprayed. None of the coatings was self-bonding J.A. 812-14, DX KU (clad aluminum); J.A. 814-15, DX KV (clad nickel oxide); J.A. 872-73, DX KE-7 (clad aluminum oxide)

3. If the nickel core of the accused clad powders is replaced with a core material which has less available nickel for exothermic intermetallic reaction, the bond strength of the coating on the sprayed surface progressively diminishes (J.A. 825-26), despite the theoretical irrelevance of such reduction if the aluminum oxidation hypothesis were correct.

Cores of nickel, pre-reacted 95:5 nickel aluminide (AVCO PP-66) having slightly less available nickel, and pre-reacted 80:20 nickel aluminide (AVCO PP-69) having substantially less available nickel were clad with aluminum and flame sprayed.

Aluminum clad nickel (the accused powder) had a bond strength of 5,000 psi. Aluminum clad PP-66 had a bond strength of 4300 psi. Aluminum clad PP-69 had a bond strength of 1500 psi (J.A. 823-27, DX LA, DX LB, DX LD).

---

[20]See also the discussion on non-stoichiometric intermetallic reactions, *supra* at 25-29.

4. When powders containing aluminum particles which are known to oxidize are flame sprayed, self-bonding does not occur.

Aluminum, *mixtures* of nickel and aluminum, and a mixture of aluminum and aluminum oxide were flame sprayed. None of the coatings formed was self-bonding [J.A. 810-12, DX KW (aluminum); J.A. 845-47, DX KY-1, DX KY-2 (mixtures of nickel and aluminum); J.A. 864-65 (mixture of aluminum and aluminum oxide)].

5. The absence of ambient oxygen during the spraying of the accused powders does not affect its self-bonding characteristics (J.A. 820-22).

Panels of Exotec were flame sprayed with a plasma gun, using an argon-hydrogen plasma. The Exotec was self-bonding. Moreover, the bond strength achieved was slightly higher than that of Exotec when flame sprayed in air (J.A. 820-22; compare DX KZ (approximately 5300 psi in argon-hydrogen) with E. 167-68 (approximately 5000 psi in air—J.A. 789-90, 791-93).[21]

6. Though oxidation of aluminum yields enormously higher amounts of heat than its intermetallic reaction with nickel, the Exotec powder yields roughly the same amount of heat per unit weight of aluminum as Metco 404, known to react intermetallically.

The oxidation of aluminum is known to generate "vastly larger" quantities of heat than could be obtained through its intermetallic reaction with nickel (J.A. 122). While the in-

[21] Plaintiffs' expert sought to explain away the results of this test by arguing there was oxygen in an oxide layer of the nickel and speculating there was further oxygen in the argon-hydrogen furnace (J.A. 1060; O.J.A. 90). But this explanation requires that the aluminum particles contact the nickel particles, a possibility denied by the oxidation reaction theory.

termetallic reaction would produce only about 35,000 calories of heat per mole, the oxidation reaction produces about 400,000 calories of heat per mole (J.A. 122).

Yet the Metco 404 powder produces a substantially larger amount of heat than the Exotec (E. 1046, J.A. 1064). Even when the relative weights of aluminum in Metco 404 and Exotec are taken into account (there are about 3½ times as much aluminum in the 404 than in the Exotec per unit amount of nickel) (J.A. 1064) it is found that the Exotec yields roughly the same amount of heat per unit weight of aluminum as the Metco 404, where that aluminum is known to react intermetallically.[22]

7. The oxidation of aluminum has a very distinctive and characteristic appearance during flame spraying, which is not noted during the flame spraying of the accused powders and the identical Metco 450.

Dr. Ingham, who has had extensive and daily contact with flame spraying (J.A. 724-26) testified from his experience that there is a substantial amount of a distinctive smoke visible when aluminum is oxidized during flame spraying (J.A. 800-01, 810, 865-66). Yet in the case of Exotec and Metco 450, the smoke is very low (J.A. 801, 819, 866), showing that the reaction does not proceed by oxidation.

---

[22]Using the "area under the curves" method proposed by Dr. Grant (J.A. 1064). By actual count there are 1422 boxes in the area under the 404 hydrogen curve on E. 1046 and 468 boxes in the area under the Exotec in hydrogen curve on that graph. Thus, the Metco 404 produces a total of somewhat more than 3 times the amount of heat as the Exotec. Dr. Grant's measurement of a somewhat lower ratio was based on the fact that he erred by approximately 50% in computing the height of one of the Metco 404 curves from Dr. Ingham's raw data, (J.A. 953-57), never bothered to re-examine the raw data or correct his error (J.A. 1056-59), and apparently used the incorrectly plotted curve in his area under the curve computation.

8. Substantially the same bonding and oxidation resistance characteristics are achieved with Exotec and Metco 450 powder (where the aluminum is on the outside of the nickel) as with Metco 404 powder (where the aluminum is on the inside of the nickel) (J.A. 776).[23]

Plaintiffs' evidence concerning its oxidation hypothesis is based upon a highly speculative and self-serving theory of spray dynamics of its expert, according to which contact between the nickel and aluminum cannot occur because of the form of the powder (aluminum bound to a nickel core). With the aluminum particles spaced by the binder approximately 1/2,500,000 of an inch from the nickel (E. 916), the theory envisions them being thrown free and oxidizing before they have an opportunity to react with the nickel, since, as their expert conceded, any contact between the nickel and aluminum will cause an intermetallic interreaction (J.A. 283-85, 288-89).

In addition to the exhaustive proof of the intermetallic reaction mechanism set forth above, Dr. Grant, during the rebuttal case, conceded that, in the first and only occasion he had to examine a sprayed Exotec coating (J.A. 298-99), he found a product resulting from the intermetallic combination of nickel and aluminum[24] (R. 2197-2200; J.A. 1073-c—1075) *binding* the coating to the substrate (R. 2197; J.A. 1073-c). He calculated that the coating had something approaching 5% aluminum combined with nickel (J.A. 1075). Dr. Grant thus unequivocally established that aluminum and nickel combine, in the flame spraying of Exotec, in an exothermic intermetallic reaction.

---

[23] This is why the two forms of powder are used interchangeably (J.A. 658-59).

[24] See the discussion of solid solution, *supra* at 25-29.

Apparently realizing the consequences of this testimony, when he returned to the stand after luncheon recess, he referred to the amount of aluminum combined with the nickel as "significantly less than 5%," (J.A. 1091). On re-cross-examination, however, he still had to admit that a major portion of the available aluminum had combined with the nickel (J.A. 1092).

This was confirmed by Dr. Post's x-ray analysis of the spray coating produced with the accused powder, in which Dr. Post found the same intermetallic reaction product of nickel and aluminum (non-stoichiometric nickel aluminide) (J.A. 704, 706) as well as a small amount of stoichiometric nickel aluminide—Ni_3Al (J.A. 706).[25]

The trial court misconstrued Dr. Post's statements (made with regard to the stoichiometric nickel aluminide he found) that the sprayed test panel did not conform to "academically approved procedure." (J.A. 708).

Dr. Post was referring to academically approved procedures for making a phase diagram, such as E. 1004 in

---

[25]The Longo report, E. 961, referred to by neither party in its pre-or post-trial briefs, but referred to extensively by the court (O. J.A. 89) essentially supports Dr. Post's conclusions. In his summary, Longo states:

> "The composite Metco 450 [identical to Exotec] or 40% nickel-aluminum powders or Metco 405 wire are heated to an ignition point, where the nickel and aluminum combine in an exothermic reaction to form nickel aluminide." (E. 964)

Longo defines "non-stoichiometric NiAl" as compounds having less aluminum than NiAl (68.5%) (E. 966). He further refers to non-stoichiometric Ni_3Al (compounds having less aluminum than Ni_3Al) as nickel aluminum solid solution.

His report at E. 970 essentially confirms Dr. Post's, as he found non-stoichiometric Ni_3Al (solid solution), as well as a small amount of non-stoichiometric NiAl in the Metco 450 coating.

which an extremely slow cooling and annealing and solidification is allowed to occur, so that properly formed crystals of the stoichiometric compound may generate (J.A. 709 13). As Dr. Post pointed out, in any flame spray procedure when you rapidly cool the reaction product on the substrate, you tend to preserve the disordered structure and will not necessarily get anything corresponding to the phases on the "equilibrium" phase diagram made by academicians (J.A. 714-16; 1093-94, 708-13).

V. Miscellaneous Infringement Matters

All the issues herein applicable to Eutectic's Exotec powder are equally applicable to its Xuperbond and Durotec powders, all three of which are sold by plaintiff New Metals on behalf of Eutectic. Similarly these issues are equally applicable to plaintiff Metallizing's Moguloy powder (O. J.A. 76-77). Finally, there are no separate issues of infringement with regard to claim 4 of the '248 process parent which is also infringed (E. 1092-93, 1078-80).

PART II—PATENT VALIDITY

I. Summary of the Court's Opinion.

The crux of the inventions of the patents in suit is the discovery and teaching that by the selection of nickel and aluminum and the fabrication thereof into the form of a composite flame spray powder, the same constitutes the first and only self-bonding flame spray powder and the only self-bonding flame spray material other than the inferior molybdenum wire.

The Court below, in its Opinion, expressed this in terms of four key elements:

"(1) nickel-aluminum 'composite' powder,

(2) flame spray process,

(3) exothermic reaction generating additional heat, and

(4) which aids in self-bonding the resulting coating to the substrate." (O. J.A. 59).

Fully four-fifths of the Opinion of the Court below is directed to a lengthy and exhaustive review of the background of the inventions of the patents in suit, a thorough analysis of their file histories and specifications to glean these "key elements" and a comparison thereof with all of the prior art cited by the plaintiffs.

The Court concluded that the claimed nickel-aluminum exothermically reacting flame spray powder composites were synergistic, had this unexpected property of being self-bonding and were new, useful and unobvious (O. J.A. 64-70). It therefore denied plaintiffs' claim for declaratory judgment of invalidity.

II. Comment on Plaintiffs' Statement of the Issues.

Two of plaintiffs' issues presented on their cross-appeal assume certain facts as given, despite directly contrary findings of fact by the Court below. Comments on the pertinent findings are set out below in the same order as in plaintiffs' "Statement."

1. The District Court found the claimed nickel-aluminum flame spray composites were new, not "known." (O. J.A. 46, 57, 70).

2. The District Court found the claimed nickel-aluminum flame spray composites were new, not "conventional" and produced surprising and unexpected results, not "expected" ones (O. J.A. 65, 66, 67).

Plaintiffs' last two issues presented misinterpret the decision of the Court below.

3. & 4. The Court did not limit the scope of the prior art relevant to the issues of validity. It considered each and every item of prior art on the merits, regardless of whether it was in the field of flame spraying or powder metallurgy and regardless of whether the prior art disclosed or claimed pertinent subject matter.

III. Rebuttal of Plaintiffs' Stated Issues.

1. Plaintiffs' Argument that the Invention is Merely a New Use for an Old Material.

Plaintiffs urge that the Mackiw, Hensel, Herz and Grala patents render defendant's invention invalid for lack of novelty. The Court, after carefully reviewing each of these references, found to the contrary that the defendant's invention was novel (O. J.A. 46, 57, 70, 72).

Mackiw

The Mackiw patent relates to a chemical plating process for making clad composite powders for use in powder metallurgy (J.A. 322-23) and contains no teaching directed to the specific combination of nickel and aluminum, let alone of fabricating the same in the form of a flame spray powder (O. J.A. 45-46 & n. 16; J.A. 736, 738-39). While a number of examples of specific combinations of metals used in forming the composites are given (columns 5 and 6 of the patent, E. 842), neither nickel and aluminum nor any other metal pair which has the metallurgical characteristic and capability of exothermically combining to form an intermetallic compound is disclosed.

The patent does contain two lengthy lists of possible core and cladding materials, but the aluminum-nickel com-

bination is only one of the 455 possible permutations which might be formed from the lists (J.A. 327-29, 878-79), and there is no specific teaching directing the artisan to select this pair out of this huge number of possible combinations for any purpose (O. J.A. 56). The District Court's finding that there is no suggestion in Mackiw of a combination of nickel and aluminum (O. J.A. 46) is, thus, clearly supported by the record.

Hensel

Hensel teaches a procedure of coating powder granules with an adhesive and then dusting the adhesive coated particles with a further metal in powder form. The coated particles may then be pressed and sintered in order, for example, to fabricate electrical contacts. There is no teaching of utilizing the process to make a flame spray powder (O. J.A. 44; J.A. 875) or to select components, such as nickel and aluminum, which, when combined in the flame spray composite powder, have the unique characteristic of being self-bonding.

Grala

The Grala patent relates to a process for making nickel-aluminum alloys. The patentee points out that such alloys are often weak, porous and fragile because of the exothermic heat developed by the intermetallic reaction between nickel and aluminum (col. 1, lines 31-35, E. 861) and teaches solving this problem by forming the alloy in a very specific manner, *i.e.*, by using small discreet chips of nickel and larger pieces of aluminum positioned in overlying layers which are heated and melted together in an induction furnace (O. J.A. 47; J.A. 383-84).

There is nothing in the patent relating to flame spraying or to the formation of a self-bonding flame spray powder. Grala teaches away from the invention of the patents in suit as his patent would suggest the impracticality of trying to flame spray nickel-aluminum composite powders and would indicate that if an alloy of the two was essential, the components should be pre-reacted in the manner taught in the patent before being fabricated into a flame spray material and sprayed. Such a pre-reacted nickel-aluminum powder would not be self-bonding (J.A. 877-78).

Herz

The Herz patent teaches the preparation of nickel-aluminum alloy having the proportions of the stoichiometric intermetallic compound NiAl and points out that the tendency of this alloy to deteriorate at high temperatures may be avoided by adding zirconium as a third alloy component (O. J.A. 46).

The patent has nothing to do with flame spraying and does not teach the formation of a self-bonding flame spray composite (J.A. 877-78). As with Grala, this patent, at best, would teach away from forming such a composite, as it indicates that nickel-aluminum alloys may present problems which could only be avoided by preforming the same in a specific manner or as an alloy containing zirconium.

Plaintiffs argue that the District Court found that both Mackiw and Hensel disclose the formation of the claimed nickel-aluminum composites and, therefore, that the use of these "known" composites in flame spraying merely constitutes a new use for an "old" material.

The District Court found that Mackiw disclosed one general procedure for forming composites, which could be

used for making the composites in accordance with the claimed invention. It further found that Hensel disclosed another general procedure for making composites which could be used for making the composites in accordance with the invention.[26] The Court specifically found, however, that these references did *not* teach or indicate the choice or selection of nickel and aluminum as the components, and thus did not teach the nickel-aluminum composites (O. J.A. 46, 57, 70). In the same manner, it found that neither Herz nor Grala taught or disclosed nickel-aluminum composites; the patents instead taught the formation of a nickel-aluminum alloy or intermetallic compound. Even if these alloys or compounds were fabricated in powder form for flame spraying, they would not constitute composites and would not be self-bonding, as the nickel and aluminum are already in reacted or alloyed form.

The '515 patent is not directed to an "old" material, but rather to a novel one and plaintiffs' line of cases commencing with *Old Town Ribbon & Carbon Co. v. Columbia Ribbon & Carbon Mfg. Co.*, 159 F.2d 379, 382 (2d Cir. 1947) is, therefore, irrelevant to the question of its validity.

Even if there were no novelty *whatever* in the patentees' nickel-aluminum flame spray powders, the '248 process patent in suit would still be valid as a "new use" patent.

In *Rohm & Haas Co. v. Roberts Chemicals, Inc.*, 245 F.2d 693 (4th Cir. 1957) the court took note of the "rule that a new use of an old product was not patentable, laid down by the courts prior to the enactment of the patent statute of 1952," and went on to explain that such new (and unobvious) uses are now clearly patentable under the 1952 Act in the process patent

[26] Further confirming defendant's position concerning the term "composites." See *supra* at 22.

category. *Id.* at 699 (See also the cases cited by the Court below at O. J.A. 55 & n. 24).

The unexpected self-bonding results obtained by following the process patent herein support its patentability in the same fashion as the unexpected results in those cases.

Moreover, it is well established that where the invention must be fabricated from judicious hindsight selection of components, the reference should not be considered anticipatory. *Ling-Temco-Vought Inc. v. Kollsman Instrument Corp.*, 372 F.2d 263, 268 (2d Cir. 1967); *Application of Luvisi*, 342 F.2d 102, 106-07 (C.C.P.A. 1965). As noted in *Luvisi:*

> "[W]e doubt if references which are not directed to the same purpose and do not have the same inventive concept, can be fairly applied in rejecting claims such as those on appeal where anticipation can be found only by making one of a very great number of possible permutations which are covered by the reference disclosures." *Id.* at 107.

2. Plaintiffs' Argument that the Self-Bonding Achieved by the Claimed Nickel-Aluminum Composite Powders Was Expected.

As pointed out in the infringement section hereof, prior to the invention claimed in the patents in suit, a major problem in the flame spray art was to secure a firm and reliable bond between the sprayed coating and the surface being sprayed.

The only known flame spray material which could be used to aid in achieving such bond was molybdenum wire, which was self-bonding. Though molybdenum wire had many disadvantages, it was very widely used as a bonding coat in the flame spray field, since, as plaintiffs' own witnesses conceded, the artisan simply had no other choice (O. J.A. 21-22). Plaintiffs, in their brief, totally ignore this portion of the

scope and content of the prior art as found by the District Court and universally supported by the record.

The crux of the invention and the claims in issue herein resides in the discovery and teaching that if one *selects* aluminum and nickel from the universe of materials available and combines them into a composite flame spray powder, the powder, when flame sprayed, is unexpectedly self-bonding, being superior to, and overcoming the disadvantages of molybdenum wire, the only prior known self-bonding flame spray material (See O. J.A. 64-65 & n. 27).

As recognized by the Court below, this unexpected self-bonding characteristic of the nickel-aluminum composite flame spray powder lends great weight to the validity of the patents in suit. *United States v. Adams,* 383 U.S. 39, 51-52 (1966); *Application of Papesch,* 315 F.2d 381, 391 (C.C.P. A. 1963); *Schering Corp. v. Gilbert,* 153 F.2d 428, 431-32 (2d Cir. 1946); (O. J.A. 68).

Plaintiffs would pretend that "self-bonding" is merely an expected function of sufficiently heating the particles being sprayed, so that the ability of generating heat during spraying would be expected to aid in bonding and to produce this result.

This, however, overlooks the fact that molybdenum wire, the only prior known self-bonding material, did not generate heat when sprayed and was *not* an exothermically reacting material (J.A. 855).[27] Indeed, there is not a shread of teaching in the voluminous prior art suggesting a relationship between added heating of the particles and the highly advantageous property of self-bonding.

---

[27]Molybdenum is so different from the nickel-aluminum composites of the patents in suit that plaintiffs have not even relied on the Shepard patent, covering the use of molybdenum as a flame spray material, in their validity arguments (J.A. 852-53; O. J.A. 99, n. 27)

It furthermore overlooks the clear showing in the record that in flame spraying there is no problem in heating particles to as high a temperature as desired and even to overheat them, and yet they will not self-bond. In fact, overheating of particles generally decreases bond strength. It is, therefore, apparent that there is something special about the metallurgical nature of the aluminum-nickel composite itself which allows it to self-bond as it is sprayed and generates heat (J.A. 809-10).

As found by the District Court, none of the prior art patents relief upon by plaintiffs claimed or disclosed a self-bonding material (O. J.A. 64-65 & n. 27), and even taken together they would not have made it obvious to one skilled in the art that a composite of nickel and aluminum powder would be self-bonding (O. J.A. 65).

Gutzeit

The Gutzeit patent, along with his publication, teach the formation of a unique and specialized material by taking waste plating and precipitate from a specific type of nickel plating bath, grinding it up and flame spraying it to form a coating. As the Court noted, the powder is a pre-reacted alloy of nickel and phosphorus (O. J.A. 51, 57). Being a pre-reacted alloy, it would not be a composite (J.A. 856), but rather a single component.

Plaintiffs argue that the skilled metallurgist, given the teaching of Gutzeit, would do nothing more than substitute a nickel-aluminum material for Gutzeit's nickel-phosphorus material. This overlooks the fact that Gutzeit's material is a very specialized material, not obtainable in nickel-aluminum form (O. J.A. 51; J.A. 348-49, 425).

The Court found the Gutzeit powder was not self-bonding (O. J.A. 64) despite its failure to recognize the evidentiary value of defendant's interpartes tests. At those tests (J.A. 858-59), the Gutzeit material was flame sprayed and found to have zero bond sterngth and not to be adherent to a substrate unless it was mechanically treated (J.A. 855-63; DX KE-1, DX KE-3, DX KE-4).[28]

The fact that this material (as well as all other prior art materials relied upon by plaintiffs) is *not* self-bonding would hardly teach skilled artisans to press on and look for self-bonding in related materials. To the contrary, it would discourage them from seeking self-bonding in such materials (O. J.A. 65).

Bradstreet

This patent is directed to providing additional heat in the flame spraying of a refractory oxide, such as aluminum oxide, to allow this higher melting material to reach its sintering temperature. One mode of providing this additional heat is by injecting finely divided aluminum powder (as a mixture) into the flame along with the refractory oxide. The patentee points out that the aluminum oxidizes, providing ad-

[28]Plaintiffs acknowledged proper notice of these tests, but chose not to attend them (J.A. 787-88). At trial they raised questions about the parameters used in the flame spraying and the Court declined to accept the evidence of these tests (O. J.A. 99, n. 26). Plaintiffs should not have been permitted to raise such questions any more than they could suggest questions which they *might* have asked on cross-examination, during a deposition for which they were properly noticed, but refused to attend. See *Wong Ho v. Dulles*, 261 F.2d 456, 460 (9th Cir. 1958); *Gore v. Maritime Overseas Corp.*, 256 F. Supp. 104, 119 (E.D. Pa. 1966), *rev'd on other grounds*, 378 F.2d 584 (3d Cir. 1967).

The Court should have accepted the results of these tests as supporting its finding that none of the prior art powders relied upon by plaintiffs was self-bonding.

ditional heat to allow the higher melting material to reach its sintering temperature and serves as an additional source of aluminum oxide in the coating (O. J.A. 48; J.A. 863-866; Bradstreet patent, E. 849, col. 5, lines 35-47).

Here again, the District Court without the necessity of considering defendant's inter partes tests in which it was proven that the Bradstreet material was not self-bonding (J.A. 863-66, DX KE 8), found that this reference did not teach a self-bonding material (O. J.A. 64, 48) and this is more than adequately supported by the record (J.A. 863-64).

Bradstreet's teaching of a flame spray powder incorporating aluminum which oxidizes exothermically yielding vast quantities of heat, yet fails to achieve self-bonding, shows that the self-bonding achieved by the powders of the patents in suit would have been equally unexpected and the patents equally valid if the patentees had theorized an oxidation mechanism of reaction.

As the Court noted in rejecting the pertinence of Bradstreet and other references relied upon by plaintiffs:

> "[r]ather than serving to point the way to innovation . . . [such] teachings would tend to discourage one skilled in the art from investigating the methods ultimately used by Dittrich to make a combination of nickel-aluminum powder self-bond to an unprepared surface. See *Shaw* v. *E.B. & A.C. Whiting Company*, 417 F.2d 1097, 1104 (2 Cir. 1969)." (O. J.A. 65).

Haglund

The Haglund patent teaches the spraying of molybdenum disilicide with the incorporation of metallic aluminum. The patentee points out that the molybdenum disilicide particles are normally coated with silicon dioxide which prevents the particles from sticking *together* and forming an effective

coating upon being flame sprayed and that the aluminum reacts with this silicon dioxide in a thermit-type reaction to break the latter down (O. J.A. 49-50).[29] Here again, without the need to rely on the inter partes tests in which it was shown that the Haglund material is not self-bonding (DX KE-6, J.A. 867-68), the District Court found that there was no teaching of a self-bonding material in the patent (O. J.A. 64-65).

Schwayder

The Schwayder patent teaches the flame spraying of tungsten carbide with the provision of a coating of nickel on the tungsten carbide, so that when flame sprayed, the nickel may be melted to provide a matrix for the higher melting tungsten carbide, which does not melt in the process. There is no exothermic or other reaction with the use of this material. The District Court's finding that the Schwayder patent did not teach a self-bonding material is amply supported by the record (O. J.A. 49, 64-65; J.A. 873-74).

Bleakley

This patent teaches a flame spray wire of two metals which are normally immiscible, *i.e.,* will not mix together when melted, such as lead and copper. The Bleakley wire does not generate heat when sprayed, nor is the same self-bonding (O. J.A. 43, 64-65; J.A. 876-77).

Montgomery

This patent relates to the formation and spraying of cermet flame spray materials. Cermet material is a combination of a metal and a refractory oxide. The patentee teaches the ap-

[29]Dr. Grant's statements at trial that the patents in suit excluded an oxidation reaction were premised on those statements in the patent and in the file history differentiating the invention from the known thermit reaction (J.A. 124; See '515 patent, col. 6, lines 9-13 ["oxidation reaction, in which a *foreign and non-metallic* element is introduced..."])

plying of the cermet to a surface by a "powder weld" type process, *i.e.*, a process which involves a subsequent fusing or welding step. There is nothing in the patent which even remotely relates to a self-bonding material, and his materials are not self-bonding (O. J.A. 44, [illegible]-65; J.A. 870-73).

Though each of the prior art patents teaches fragments of the invention, *e.g.*, flame spray powders, or methods of making composites generally, there is nothing in the art which would teach or suggest that a nickel-aluminum flame spray composite would yield the first self-bonding material other than the inferior molybdenum wire.

The disclosure of the patents in suit adds very valuable knowledge to the public domain and in no way restricts access to any materials already available. Nickel-aluminum self-bonding flame spray composites were simply never available before the patents in suit.

Thus, the Court quite properly concluded that:

> "it is difficult to believe that one reasonably skilled in the art would have found it obvious to combine the teaching of the prior art with the concept or reality of a *self-bonding* flame spray material as taught in the claims in suit." (O. J.A. 65).

3. Plaintiffs' Argument that the Court Failed to Consider "Powder Metallurgy" Patents.

Plaintiffs argue that the District Court erred in divorcing the art of flame spraying from the art of powder metallurgy, and thus failed to consider the importance of the prior art patents to Mackiw, Hensel, Herz and Grala.

The District Court found that the art of flame spraying was one of such technical complexity and industrial importance as to be considered the applicable art for purposes of the case,

i.e., in defining "a man having ordinary skill in the art" under 35 U.S.C. 103.[30] (O. J.A. 59-60).

The Court went on to find that the level of "ordinary skill" was not that of a shop artisan, but of a professionally trained technologist engaged in engineering research, having degrees in metallurgy or physical chemistry, or perhaps even advanced degrees up to a doctorate (O. J.A. 60-61).[31] It was against this level of a skilled artisan that the District Court applied the test of obviousness under 35 U.S.C. 103. In its discussion of prior art, the Court carefully considered and weighed all of the teaching of the patents to Mackiw, Hensel, Herz and Grala (O. J.A. 44-47; 54-57).

After fully considering the teaching of this prior art, the District Court concluded that there was nothing in the references which would indicate to the skilled artisan that a self-bonding flame spray material could be obtained by *selecting nickel and aluminum and fabricating the same into the form of a composite flame spray powder.*

The District Court specifically found that there was no suggestion in Mackiw of a selection of a nickel-aluminum (O. J.A. 46). Furthermore, it correctly recognized that the Grala and Herz patents were directed to overcoming shortcomings of nickel-aluminum alloys in the form of intermetallic compounds by specific melting methods used for making the alloys or by adding zirconium as a further alloy component

---

[30]This finding is certainly not clearly erroneous and is well supported by the record (J.A. 727-28, 735-37, 738-39; E.35).

[31]Defendant submits the Court erred in finding such a high level of "ordinary skill." It is not the experts chosen to testify at trial or the men skilled enough to have patents who are those ordinarily skilled in the art, but rather those directly involved in the art herein at the time the invention was made, master mechanics and those in charge of plant maintenance (J.A. 639, 662-63, 726-27; R. 1338-39) *Abington Textile Works v. Carding Specialists, Ltd.*, 249 F. Supp. 823, 829 (D.D.C. 1965).

(O. J.A. 46-47). Nothing in either patent suggests a *composite* of nickel and aluminum, let alone a flame spray material to achieve self-bonding.

4. Plaintiffs' Argument that the Court Limited its Consideration to the Claims of the Prior Art.

Plaintiffs' final stated issue is that the District Court erred by improperly limiting the teaching of the prior art patents to only what was claimed in these patents, rather than to what was disclosed in these patents. This statement is simply not supported by the Court's decision, which carefully analyzes the disclosure and teaching of the references as a whole (O. J.A. 42-51), even where the allegedly pertinent disclosure of the particular reference did not form any part of its claimed invention (O. J.A. 44).

For example, in connection with the Mackiw patent, the District Court carefully considered the teaching of the component metals that its composite powders could have, and found that there was no suggestion of a combination of nickel and aluminum, but that these components are merely listed in a very large group of metals having similar properties (O. J.A. 45-46, 55-56). The record clearly establishes that of the 455 possible combinations of metals taught in Mackiw, there is nothing to lead to or suggest the judicious selection of nickel and aluminum (J.A. 327-29, 878-79; R. 1060-61).

IV. Rebuttal to Plaintiffs' Arguments Not Found In Their "Statement Of Issues"

Interwoven among plaintiffs' arguments are a number which have no direct relevance to their statement of issues presented. Without conceding that these issues are ripe for adjudication, they will be briefly treated hereinafter.

1. Plaintiffs' Argument that the Self-Bonding Feature is Not Recited in the Claims

The patent specifications clearly teach that the nickel-aluminum composite flame spray materials, when sprayed, are self-bonding and may be used for bonding purposes, *i.e.*, as a bonding coat.[32] The self-bonding feature inherently results from the selection of the components, *i.e.*, the nickel and aluminum, and the forming of the same into flame spray composites. The claimed powders in the '515 patent thus are self-bonding powders, and the process of spraying the same, as claimed in the '248 patent, will necessarily result in a self-bonding coating.

It is well established that patentability may be predicated on the inherent, unexpected results of the claimed composition or process, without reciting these results *in the claim.* It is the function of the specification and supporting affidavits to outline these unexpected results, not the claim.

As the court ruled in *Rosen v. Lawson-Hemphill, Inc.*, 399 F. Supp. 532 (D.R.I. 1975):

> "Claim 1 of the patent defines the structure and the inherent advantages flowing from such structure need not be specifically mentioned."

Accord, Application of Papesch, 315 F.2d 381, 391 (C.C.P.A. 1963):

> "From the standpoint of patent law, a compound and all of its properties are inseparable; they are one and the same thing.
>
> * * *
>
> But a formula is not a compound and while it may serve in a *claim* to *identify* what is being patented, as the metes and bounds of a deed identify a plot of land, the *thing*

[32]See, *e.g.*, '515 patent, col. 6, lines 19-21, Example 1, col. 7, lines 523-27.

> that is patented is not the formula but the compound identified by it. And the patentability of the thing does not depend on the similarity of its formula to that of another compound but on the similarity of the former compound to the latter. There is no basis in law for ignoring any property in making such a comparison."

See also the myriad cases in which the claims merely recite chemical compositions and validity over the prior art was based on the inherent features of such compositions, for example, *Schering Corp. v. Gilbert*, 153 F.2d 428, 429, 431-432 (2d Cir. 1946); *Application of Davies*, 475 F.2d 667, 668, 672 (C.C.P.A. 1973); *Application of Albrecht*, 514 F.2d 1385, 1386, 1388 (C.C.P.A. 1975).

Plaintiffs' reliance on *Maclaren v. B-I-W Group Inc.*, 535 F.2d 1361 (2d Cir. 1976) is wholly misplaced. There, the feature upon which patentability was based was not even disclosed in the specification, as it is in the instant case ('515 patent, col. 6, lines 19-21; col. 7, lines 23-27). The court concluded that patentability may not be based on an *undisclosed* feature.

2. Plaintiffs' Arguments Concerning Validity of the '248 Process Patent

The '248 patent is directed to an improvement in the flame spraying process. The improvement resides in the use of a novel flame spray material in the form of a composite containing nickel and aluminum which unexpectedly results in a self-bonding coating. The subject matter is clearly patentable as found by the District Court (O. J.A. 72-76). The Court's decision was based upon a careful analysis of the decision of the Court of Customs and Patent Appeals in *Application of Kuehl*, 475 F.2d 658 (C.C.P.A. 1973).

Two more recent C.C.P.A. decisions support this analysis, *Application of Mancy*, 499 F.2d 1289 (C.C.P.A. 1974); *Ap-*

plication of Way, 514 F.2d 1057 (C.C.P.A. 1975), and like *Kuehl* distinguish plaintiffs' *Application of Kanter,* 399 F.2d 249 (C.C.P.A. 1968).

3. Plaintiffs' Arguments Concerning the First Nickel-Aluminum Flame Spray Composites

Plaintiffs argue that the patented nickel-aluminum flame spray powder was originated by Sherritt Gordon, despite findings of the Court directly to the contrary (O. J.A. 56-57).

The Sherritt Gordon powders which patentees did, admittedly, use were not in the prior art, but were made by Sherritt Gordon to patentees' specifications, on the patentees order. *Ibid.*

Even if the patentees had not specifically explained to Sherritt Gordon what they wanted, but had simply gone to them with a problem of how to make their nickel-aluminum flame spray composites, the law is well settled that it would not affect the validity of their patents. *Metal Film Co. v. Metlon Corp.,* 316 F. Supp. 96, 106 (S.D.N.Y. 1970); *O'Reilly v. Morse,* 56 U.S. 62 (1853); *Hobbs v. U.S. Atomic Energy Commission,* 451 F.2d 849, 864 (5th Cir. 1971); *Agawam Woolen Co. v. Jordan,* 74 U.S. 583, 602-03 (1869).

4. Plaintiffs' Miscellaneous Arguments Concerning the File History of the Patents in Suit

The District Court carefully reviewed the file history of the patents in suit (O. J.A. 32-42) and concluded:

> "Painstaking review of the extensive file wrapper history of the patents in suit persuades the court that plaintiffs have done little more than repeat every argument made by a series of examiners during the patent

prosecution, which eventually resulted in the issuance of the patents in suit." (O. J.A. 71).[33]

This further enhances the normal presumption of patent validity under 35 U.S.C. 282. *Rich Products Corp. v. Mitchell Foods, Inc.*, 357 F.2d 176, 181 (2d Cir. 1966).

In this initial application (E. 176), the patentees combined several inventions in order to secure an early filing date and preserve rights of priority in "first to file" countries. *Cf.* 35 U.S.C. 119.

One of these inventions included nickel-phosphorous composites in which the phosphorus would act with the nickel when flame sprayed not to form a *self-bonding* coating, but with the phosphorus acting as a fluxing element for the nickel. After objection by the Patent Office that the application contained and claimed more than one invention, the application was ultimately refiled in the form which issued to patent, limited to the invention in which the components of the composite would exothermically react forming self-bonding coatings.

The nickel-phosphorus composites were naturally omitted, as they did not constitute a part of this invention and were not self-bonding. In any event, the prior art does not disclose

---

[33]All the patents cited by the plaintiffs herein, except one, were reviewed by the Patent Office in connection with the prosecution leading to the patents in suit. Those patents specifically cited by the Patent Office in connection with the parent applications, including Gutzeit, must be presumed to have been reviewed and discarded when the application was narrowed down to the self-bonding powders ("In all continuing applications, the parent application should be reviewed by the examiner for pertinent prior art"—M.P.E.P. Section 904; *United States Gypsum Co. v. National Gypsum Co.*, 440 F.2d 510, 514 (7th Cir. 1971). The one exception was the Haglund patent, directed to a typical thermit-type reaction, a reaction thoroughly explored during prosecution in connection with the Bayer reference (E. 674-75).

nickel-phosphorus composites, but rather a specialized pre-reacted nickel-phosphorus alloy powder which is also not self-bonding (see the discussion of Gutzeit, *supra,* at 44).

In the first application in which the patentability of the self-bonding powders was discussed on the merits (E. 599) the patent was allowed.[34]

Plaintiffs argue that during this application, the patentees had made an erroneous and misleading statement to the Examiner with respect to the Mackiw prior art reference, to the effect that none of the combinations disclosed in Mackiw was exothermically reactive. The patentees' statement was absolutely correct and a similar finding was made by the District Court after studying the patent and hearing testimony relating thereto. (See the discussion of Mackiw, *supra* at 38).

5. Plaintiffs' Arguments Concerning the Secondary Indicia of Patentability

The District Court found that the patents in suit had shown "conspicuous commercial success" in displacing molybdenum in existing flame spray utilization and opening up new areas of application where the sprayed part was to be used at elevated temperature" (O. J.A. 69; J.A. 648-52, 653-54, 661-62, 670).

After Dittrich's initial reduction to practice of the invention, Metco engaged in a heavy and expensive project toward commercialization which took place about 1964 and immediately met with commercial success, selling 50,000

[34]Plaintiffs' derogatory reference to the interviews granted during the prosecution wholly ignores the fact that these interviews are specifically authorized by Rule 133 of the Rules of Practice, 37 C.F.R. 133, and "encouraged" by the Patent Office "to assist in early and equitable conclusion of examination of applications." (Commissioner's Notice of September 16, 1964, quoted in 1 Horowitz, Patent Office Rules of Practice § 133.2 (1973)).

pounds of the material during its first year (O. J.A. 69). Through 1973, Metco had sold over 20 million dollars of the products made in accordance with the invention, including about $4 million of the 404 powder (similar to Example 1 of the '515 patent) and about $5 million of the 450 powder (similar to Example 31 of the '515 patent) (J.A. 682-83).

This enormous commercial success, coupled with the slavish copying by plaintiffs, heavily reinforce the Court's conclusion of validity. *Rich Products Corp. v. Mitchell Foods, Inc.*, 357 F.2d 176, 181 (2d Cir. 1966); *Kurtz v. Belle Hat Lining Co.*, 280 Fed. 277, 281 (2d Cir. 1922) (imitation by the accused infringer).

PART III—COSTS

1. The District Court Erred in Awarding All Costs to Plaintiffs

Despite its option of seeking declaratory relief on the issue of infringement alone, plaintiffs brought the instant action seeking a declaratory judgment that the patents in suit were invalid.

At least one half of the discovery and trial went to the issues of patent validity, yet the Court found plaintiffs raised no validity issues not already raised by the Patent Office (O. J.A. 71). Plaintiffs' claim for declaratory relief of invalidity was denied by the Court, so that neither party may be considered a prevailing party within the meaning of Rule 54(d) F.R.C.P. See *Srybnik v. Epstein*, 230 F.2d 683, 686 (2d Cir. 1956):

> "In a case such as this where the defendant counterclaims for affirmative relief and neither party prevails on its claim, it is quite appropriate to to deny costs to both parties . . ."

See also *Magee v. McNany*, 11 F.R.D. 592 (W.D. Pa 1951); *H.H. Robertson Co. v. Klauer Mfg. Co.*, 98 F.2d 150 (8th Cir. 1938); *Steel Const. Co. v. Louisiana Highway Comm.*, 60 F. Supp. 183, 192-93 (E.D. La. 1945).

Conclusion

The judgment that the patents in suit are valid is sound and should be affirmed. The discovery and teaching that nickel-aluminum flame spray composites are self-bonding is new, useful and unobvious irrespective of whether the reaction mechanism is by intermetallic formation or by oxidation.

As claims 4 and 14 of the '515 patent and claim 4 of the '248 patent are literally infringed and, in any event, the accused powders are produced substantially as described in the patents, work in the same manner and achieve the same self-bonding results, the judgment of non-infringement should be reversed.

Finally, the District Court's award of costs to plaintiffs should be reversed. Even under its own ruling, the Court should have denied costs to both parties.

Respectfully submitted,

ARNOLD SPRUNG,
NATHANIEL D. KRAMER,
Burgess, Dinklage & Sprung,
600 Third Avenue,
New York, New York 10016,

Attorneys for Defendant-Appellant and Cross-Appellee.